

Listing of Claims

- 1 1. (Original) A method for executing an operation upon a linked data structure having at
2 least one element, the method comprising the steps of:
 - 3 (a) performing a first set of operation tasks in a first phase, the first set of operation
4 tasks operable to effect a first set of element state transitions;
 - 5 (b) developing a second set of operation tasks, the second set of operation tasks
6 operable to effect a second set of element state transitions, the second set of
7 element state transitions being distinct from the first set of element state
8 transitions; and
 - 9 (c) performing the second set of operation tasks in a second phase.
- 1 2. (Original) The method of claim 1 wherein the first set of operation tasks includes
2 navigating existing data structure links.
- 1 3. (Original) The method of claim 1 wherein the step of developing a second set of
2 operation tasks further comprises developing pointers to the data structure, the pointers being
3 used in the step of performing the second set of operation tasks in a second phase.
- 1 4. (Original) The method of claim 1 wherein operation tasks of the second set of operation
2 tasks are performed atomically.
- 1 5. (Original) The method of claim 1 wherein the step of developing a second set of
2 operation tasks further comprises developing the second set of operation tasks as a list.
- 1 6. (Original) The method of claim 5 wherein the list further comprises a first in last out list.

1 7. (Original) The method of claim 1 wherein the step of developing a second set of
2 operation tasks further comprises a step of performing a conflicts check for the operation.

1 8. (Original) The method of claim 1 wherein the first set of element state transitions further
2 comprises:

- 3 (a) a valid state to a pending delete state transition;
- 4 (b) a pre-associated state to a pending insert state transition; and
- 5 (c) a pending insert state to a hidden state transition.

1 9. (Original) The method of claim 1 wherein the second set of element state transitions
2 further comprises:

- 3 (a) a pending insert state to a valid state transition;
- 4 (b) a pending delete state to an invalid state transition;
- 5 (c) a hidden state to an invalid state transition;
- 6 (d) a pending delete state to a valid state transition;
- 7 (e) a hidden state to a pending insert state transition; and
- 8 (f) a pending insert state to an invalid state transition.

1 10. (Original) A method for performing insertion and deletion operations on elements in a
2 linked data structure, the method comprising the steps of:

- 3 (a) performing a first set of operation tasks in a first phase for each insertion and
4 deletion operation, the first set of operation tasks operable to effect a first set of
5 element state transitions;

- 6 (b) developing a second set of operation tasks for each insertion and deletion
7 operation, the second set of operation tasks operable to effect a second set of
8 element state transitions, the second set of element state transitions being distinct
9 from the first set of element state transitions; and
10 (c) performing the second set of operation tasks in a second phase.

1 11. (Original) A method for executing operations upon a linked data structure having at least
2 one element, the method comprising the steps of:

- 3 (a) queuing operation tasks in a task queue;
4 (b) receiving the queued operation tasks;
5 (c) performing a first set of operation tasks in a first phase, the first set of operation
6 tasks operable to effect a first set of element state transitions;
7 (d) developing a second set of operation tasks, the second set of operation tasks
8 operable to effect a second set of element state transitions, the second set of
9 element state transitions being distinct from the first set of element state
10 transitions; and
11 (e) performing the second set of operation tasks in a second phase.

1 12. (Original) The method of claim 11 further comprising repeating steps (a) through (e).

1 13. (Original) A method of inserting an element into a linked data structure comprising the
2 steps of:

- 3 (a) performing a first set of operation tasks in a first phase, the first set of operation
4 tasks operable to effect a first set of element state transitions including a pre-
5 associated state to a pending insert state transition;

- (b) developing a second set of operation tasks, the second set of operation tasks operable to effect a second set of element state transitions including a pending insert state to a valid state transition; and
- (c) performing the second set of operation tasks in a second phase.

14. (Original) The method of claim 13 wherein the pre-associated state to a pending insert state transition is accomplished by:

- (a) marking the element to be inserted as being pre-associated to the data structure;
- (b) navigating the data structure to an insertion point;
- (c) creating links between the element to be inserted and the data structure at the insertion point, the links created being visible only to the insertion operation; and
- (d) marking the element as being pending insert.

15. (Original) The method of claim 14 wherein the pending insert state to a valid state transition is accomplished by:

- (a) creating instructions for making the created links visible to all operations; and
- (b) creating instructions for making existing links at the insertion point invisible to all operations.

16. (Original) The method of claim 15 wherein the step of performing the second set of operation tasks further comprises executing the created instructions including marking the element as valid.

1 17. (Original) A method of deleting an element from a linked data structure comprising the
2 steps of:

- 3 (a) performing a first set of operation tasks in a first phase, the first set of operation
4 tasks operable to effect a first set of element state transitions including a valid
5 state to a pending delete state transition;
- 6 (b) developing a second set of operation tasks, the second set of operation tasks
7 operable to effect a second set of element state transitions including a pending
8 delete state to an invalid state transition; and
- 9 (c) performing the second set of operation tasks in a second phase.

1 18. (Original) The method of claim 17 wherein the valid state to a pending delete state
2 transition is accomplished by:

- 3 (a) navigating the data structure to a deletion point;
- 4 (b) creating links at the deletion point visible only to the deletion operation; and
- 5 (c) marking the element to be deleted as pending delete.

1 19. (Original) The method of claim 18 wherein the pending delete state to an invalid state
2 transition is accomplished by:

- 3 (a) creating instructions for making the created links visible to all operations; and
- 4 (b) making existing links at the deletion point invisible to all operations.

1 20. (Original) The method of claim 19 wherein the step of performing the second set of
2 operation tasks further comprises executing the instructions including marking the element to be
3 deleted as invalid.

1 21. (Original) A method for executing an operation upon a linked data structure having at
2 least one element, the method comprising the steps of:

- 3 (a) grouping a first plurality of operation tasks of the operation in a first set of
4 operation tasks, the first set of operation tasks operable to effect a first set of
5 element state transitions;
- 6 (b) performing the first set of operation tasks in a first phase;
- 7 (c) grouping a second plurality of operation tasks of the operation in a second set of
8 operation tasks, the second set of operation tasks operable to effect a second set of
9 element state transitions, the second set of element state transitions being distinct
10 from the first set of element state transitions; and
- 11 (d) performing the second set of operation tasks in a second phase.

1 22. (Original) A method for executing an operation upon a linked data structure having at
2 least one element, the method comprising the steps of:

- 3 (a) creating first and second sets of operation tasks, the first set of operation tasks
4 being characterized by navigation of the linked data structure using at least an
5 existing link, and the second set of operation tasks being distinct from the first set
6 of operation tasks and being characterized by at least a pointer to the linked data
7 structure; and
- 8 (b) performing the first set of operation tasks in a first phase and the second set of
9 operation tasks in a second phase.

1 23. (Original) A method for executing an operation upon a linked data structure having at
2 least one element, the method comprising the steps of:

- (a) dividing the operation into first and second distinct sets of operation tasks;
- (b) performing the first set of operation tasks in a first phase; and
- (c) performing the second set of operation tasks in a second phase.

24. (Original) The method of claim 23 wherein the first set of operation tasks is operable to maintain the linked data structure in an existing linked state.

25. (Original) The method of claim 24 wherein the second set of operation tasks operable to modify the existing linked state.

26. (Original) The method of claim 23 wherein the first set of operation tasks is visible only to the operation.

27. (Original) The method of claim 26 wherein the second set of operation tasks is visible to each of a plurality of operations upon the linked data structure.

28. (Original) A system for executing an operation upon a linked data structure having at least one element, the system comprising:

- (a) a memory for storing the linked data structure;
- (b) a processor coupled to the memory, the processor operable to perform a first set of operation tasks in a first phase, the first set of operation tasks operable to effect a first set of element state transitions, to develop a second set of operation tasks, the second set of operation tasks operable to effect a second set of element state transitions, the second set of element state transitions being distinct from the first

9 set of element state transitions, and to perform the second set of operation tasks in
10 a second phase.

1 29. (Original) A system for executing an operation upon a linked data structure having at
2 least one element, the system comprising:

- 3 (a) a memory for storing the linked data structure;
- 4 (b) a processor coupled to the memory and operable to divide the operation into first
5 and second distinct sets of operation tasks, perform the first set of operation tasks
6 in a first phase, and perform the second set of operation tasks in a second phase.

1 30. (Original) A computer readable medium for executing an operation upon a linked data
2 structure having at least one element, the computer readable medium comprising:

- 3 (a) a code segment for performing a first set of operation tasks in a first phase, the
4 first set of operation tasks operable to effect a first set of element state transitions;
- 5 (b) a code segment for developing a second set of operation tasks, the second set of
6 operation tasks operable to effect a second set of element state transitions, the
7 second set of element state transitions being distinct from the first set of element
8 state transitions;
- 9 (c) a code segment for performing the second set of operation tasks in a second
10 phase.

1 31. (Original) A computer readable medium for executing an operation upon a linked data
2 structure having at least one element, the computer readable medium comprising:

- 3 (a) a code segment for dividing the operation into first and second distinct sets of
4 operation tasks;

- 5 (b) a code segment for performing the first set of operation tasks in a first phase; and
- 6 (c) a code segment for performing the second set of operation tasks in a second
- 7 phase.

1 32. (Original) A system for executing an operation upon a linked data structure having at
2 least one element, the system comprising:

- 3 (a) a means for performing a first set of operation tasks in a first phase, the first set of
- 4 operation tasks operable to effect a first set of element state transitions;
- 5 (b) a means for developing a second set of operation tasks, the second set of
- 6 operation tasks operable to effect a second set of element state transitions, the
- 7 second set of element state transitions being distinct from the first set of element
- 8 state transitions; and
- 9 (c) a means for performing the second set of operation tasks in a second phase.

1 33. (Original) A system for executing an operation upon a linked data structure having at
2 least one element, the system comprising:

- 3 (a) a means for dividing the operation into first and second distinct sets of operation
- 4 tasks;
- 5 (b) a means for performing the first set of operation tasks in a first phase; and
- 6 (c) a means for performing the second set of operation tasks in a second phase.

1 34. (Original) A method for executing an operation upon a linked data structure having at
2 least one element, the method comprising the steps of:

- 3 (a) creating a first set of operation tasks, the first set of operation tasks being
4 characterized by navigation of the linked data structure using at least an existing
5 link;
- 6 (b) creating a second set of operation tasks, the second set of operation tasks being
7 different from the first set of operation tasks and being characterized by location
8 of elements within the linked data structure using at least one pointer created by
9 the first set of operation tasks; and
- 10 (c) performing at least one operation task of the first set of operation tasks in a first
11 phase and at least one operation task of the second set of operation tasks in a
12 second phase.

1 35. (Original) The method of claim 34 wherein the first set of operation tasks is operable to
2 maintain consistent navigation of the linked data structure.

1 36. (Original) A consistent method of executing simultaneous operations on a linked data
2 structure having at least one element, the method comprising the steps of:

- 3 performing any first phase operation task of each of the simultaneous operations in a first
4 phase using parallel processes;
- 5 developing a set of serial operations during the first phase; and
- 6 performing any second phase operation task of each of the simultaneous operations in a
7 second phase, the second phase operation task including at least one of the set of
8 serial operations.